

At the Greenwich mean noon observations on the 16th moderate weather was the rule over practically the entire ocean, although a disturbance appeared later in the day over the eastern section, where unusually low pressure with cyclonic disturbances in quick succession, prevailed until the end of the month. However, the extent and intensity of the storm areas varied somewhat from day to day.

Storm logs from vessels in the eastern sections of the ocean during the period from the 13th to 31st are as follows:

British S. S. *Lord Antrim*:

Gale began on the 16th, wind SW. Lowest barometer 29.01 inches at 10 a. m. on the 17th, wind WSW., in latitude 51° 05' N., longitude 19° 15' W. End on the 18th, wind W. Highest force of wind 11; shifts SW.-WSW.-W.

Danish S. S. *United States*:

Gale began on the 17th, wind ENE. Lowest barometer 28.62 inches at 8 a. m. on the 17th, wind ENE., in latitude 55° 20' N., longitude 24° 12' W. End on the 17th. Highest force of wind 10; steady from ENE.

French S. S. *La Savoie*:

Gale began on the 17th, wind SW., 7. Lowest barometer 28.75 inches at 4 p. m. on the 20th, wind SW., 12, in latitude 49° 08' N., longitude 28° 11' W. End on the 23d. Highest force of wind 12, SW.; shifts SSW.-WNW.

British S. S. *Chickahominy*:

Gale began on the 17th, wind W. Lowest barometer 28.95 inches at 8 a. m. on the 18th, wind W., 10, in latitude 51° 08' N., longitude 19° W. End on the 19th, wind W. Highest force of wind 11; steady from W.

Danish M. S. *Peru*:

Gale began on the 21st, wind SW. Lowest barometer 29.00 inches at 8 a. m. on the 23d, wind W., 11, in latitude 42° 13' N., longitude 21° 40' W. End on the 23d, wind N. Highest force of wind 11, NNW.

American S. S. *Westland*:

Gale began on the 22d, wind W. Lowest barometer 29.61 inches at noon on the 22d, wind WNW., in latitude 44° 30' N., longitude 16° 10' W. End on the 24th, wind N. Highest force of wind 11, W.; shifts W.-WNW.-NW.

French S. S. *Canada*:

Gale began on the 23d, wind WSW. Lowest barometer 29.70 inches at 3 a. m. on the 24th, wind W., 10, in latitude 36° 35' N., longitude 11° 30' W. End on the 25th, wind NE. Highest force of wind 10; shifts WSW.-W.-NW.

Danish S. S. *Arkansas*:

Gale began on the 23d, wind SW. Lowest barometer 28.90 inches at 8 p. m. on the 24th, wind SW., 8, in latitude 54° 30' N., longitude 30° W. End on the 26th, wind NW. Highest force of wind 11; shifts SW.-WSW.-W.-NW.

American S. S. *Chickasaw City*:

Gale began on the 25th, wind SW. Lowest barometer 28.40 inches at 4 p. m. on the 29th, wind WSW., 8, in latitude 51° 05' N., longitude 21° 10' W. End on the 30th, wind NW. Highest force of wind 10, N.; shifts S.-WSW.-N.-NE.

Belgian S. S. *Sunoco*:

Gale began on the 29th, wind W. Lowest barometer 28.73 inches at 1:30 a. m. on the 30th, wind SW., 10, in latitude 48° 34' N., longitude 16° 53' W. End on January 2, wind NW. Highest force of wind 11; shifts SW.-NNW.

British S. S. *Cornishman*:

Gale began on the 28th, wind NW. Lowest barometer 29.23 inches at noon on the 29th, wind NW., 10, in latitude 48° 16' N., longitude 28° 01' W. End on the 30th, wind NW. Highest force of wind 10, NW., steady from NW.

Dutch S. S. *Orestes*:

Gale began on the 27th, wind WNW., 7. Lowest barometer 28.92 inches at 2 p. m. on the 30th, wind SW., 10, in latitude 45° 17' N., longitude 7° 18' W. End on the 31st, wind NW., 6. Highest force of wind 11; shifts SW.-W.-WNW.-NW.

On the 21st and 22d there was a disturbance in the region between Bermuda and Hatteras that on the latter date began to move rapidly northeastward, as on the 23d the center was about 200 miles east of Nova Scotia. Storm logs follow.

American S. S. *Saugus*:

Gale began on the 21st, wind NE. Lowest barometer 29.53 inches at 9 a. m. on the 21st, wind NE., 9, in latitude 38° 03' N., longitude 70° 11' W. End on the 21st, wind NE. Highest force of wind 11; steady from NE.

American S. S. *Minnequa*:

Gale began on the 22d, wind SW. Lowest barometer 29.45 inches at noon on the 22d, wind WSW., in latitude 35° 10' N., longitude 70° 10' W. End on the 23d, wind NW. Highest force of wind 10; shifts WSW.-WNW.

Danish S. S. *United States*:

Gale began on the 23d, wind SW. Lowest barometer 28.60 inches at 7 a. m. on the 23d, wind SW., 9, in latitude 42° 30' N., longitude 59° 40' W. End on the 23d, wind WSW. Highest force of wind 11; shifts SW.-WSW.

Charts VIII to XI show the conditions from the 27th to 30th, inclusive. On the 27th there was an area of low pressure central near latitude 45° N., longitude 45° W.; this moved slowly eastward and later reinforced the eastern disturbance. Storm logs follow.

American S. S. *Minnequa*:

Gale began on the 26th, wind SE. Lowest barometer 29.65 inches at 6 p. m. on the 26th, wind S., in latitude 39° 18' N., longitude 51° W. End on the 27th. Highest force of wind 10, S.; shifts SSE.-SSW.

American S. S. *Anaconda*:

Gale began on the 26th, wind S., 6. Lowest barometer 29.50 inches at 7 a. m. on the 27th, wind SW., 7, in latitude 43° 24' N., longitude 45° 25' W. End on the 30th, wind NW., 5. Highest force of wind 10, NW.; shifts S.-SW.-W.

NORTH PACIFIC OCEAN.

By WILLIS E. HURD.

Although stormy conditions, with snow and rain squalls, frequented the northern half of the ocean during December, there was much pleasant weather in middle and lower latitudes. At Honolulu the weather was more than usually delightful. The average hourly wind velocity at this station, 6.7 miles, was the lowest for the month during 19 years of record. Sunshine was considerably in excess of the normal, and the rainfall was the least, with the exception of that of December, 1913, in the record of the month for 36 years.

Up to the 23d of December, as indicated by the Japanese Weather Reports received at this writing, five cyclones from Asia entered the ocean after crossing the northern portion of Japan. In addition, as learned from ships' reports, storm conditions lay to the eastward of Japan as far as the 165th parallel of east longitude, for much of the remainder of the month, though they appear to have caused only moderate to strong gales. The first of the disturbances mentioned occasioned a heavy snowstorm with strong gales over the Archipelago and a great increase in the force of the northeast monsoon along the China coast on the 5th and 6th (Eastern time); and the fourth, that of December 15-16, with even more damaging gales and snowfall, more or less suspended railway traffic over the northern portion of Japan until the 18th. The other storms were of less importance.

During the same period three depressions, or minor cyclonic disturbances, appeared over more southern waters of the Far East. One, which originated to the eastward of Luzon on the 8th, moved northeastward

and passed the Bonin Islands on the 9th, apparently dying out or losing its identity shortly afterward in a cyclone then northeast of Japan. The other two originated near Taiwan on the 14th and 15th, respectively, and disappeared to the eastward or southeastward of Japan.

The continental cyclone which left the mainland on the 5th, developed great intensity east of Honshu, and several vessels reported snow squalls, storm to hurricane winds, and low pressures arising from it, during the 5th, 6th, and 7th of the month. After the 7th the storm moved into an extensive area of low pressure, then over the middle Aleutians, and its separate identity was lost. From point of wind velocity it seems to have been the most intense disturbance of December. On the 5th to 7th three Japanese steamships, eastward bound, experienced winds of force 11 to 12. The *Africa Maru*, in latitude $40^{\circ} 54' N.$, longitude $150^{\circ} 25' E.$, encountered a west-northwesterly hurricane about 10:30 a. m. of the 5th, lowest pressure 28.00 inches (uncorrected). The observer on board the *Yayoi Maru* wrote of the weather on the 6th:

Hurricane and tremendous sea. Barometer fell to 28.26 inches (corrected). Wind shifted from east to northwest slowly. Ship in danger and rolling heavily; lost her course. Highest wind force, 12 from northeast on the 7th, in latitude $48^{\circ} 05' N.$, longitude $158^{\circ} 36' E.$

On the 6th the *Somedono Maru* experienced lowest pressure, 28.54 inches, in latitude $48^{\circ} 05' N.$, longitude $168^{\circ} 25' E.$; highest force of wind, SW. 11.

The Japanese S. S. *Scotland Maru*, Captain Marui, Observer Kuwano, bound for Portland, Oreg., became involved on the 3d in a strong cyclone which was well at sea when the storm of the 5th was over Japan. At 6 a. m. of the 4th, in $46^{\circ} 50' N.$ $173^{\circ} E.$, the vessel found herself in the center of the disturbance, "where," said the observer, "the waves were so violently confused that we were unable to maneuver the ship. Barometer showed 28.40 inches." Scarcely had this storm passed on than the *Scotland Maru* was caught in the advance winds of the Japanese disturbance, of which the observer noted:

Barometer dropped to 28.96 inches, and wind and waves were more severe than in previous storm.

From December 10 to 13 the Japanese S. S. *Somedono Maru* was steaming through its second storm encountered during the voyage to Tacoma. The highest observed wind velocity was 10 from the south, but the lowest barometric reading on that date was 27.86 inches (corrected), in latitude $50^{\circ} N.$, longitude $169^{\circ} 53' W.$ The British S. S. *Shabonee* experienced this storm on the 11th, in latitude $43^{\circ} 24' N.$, longitude $163^{\circ} 28' W.$; lowest barometer reading 28.74 inches (corrected); maximum wind velocity 10, SW.

The cyclone which blockaded northern Japan with snow on the 16th to 18th was apparently not so severe at sea as that of the 5th, yet no observations were received from near the storm center, and several vessels considerably south of it reported violent winds and tremendous seas. The Japanese S. S. *Seiyo Maru*, Yokohama toward San Francisco, while in latitude $30^{\circ} 36' N.$, longitude $151^{\circ} 10' E.$, encountered a gale from NNW. to W., force 11, lowest pressure 29.55 inches, on the 16th. On the same date the American S. S. *Meigs*, in latitude $33^{\circ} 12' N.$, longitude $150^{\circ} 50' E.$, experienced "westerly wind reaching force 10 and probably stronger, and phenomenal sea, approximate height, 50 feet." The lowest pressure recorded was 29.35 inches. On the 16th also the British S. S. *Achilles*, from Hongkong toward

Victoria, was beset by a north-northwesterly gale, lowest pressure 29.35 inches, in latitude $37^{\circ} N.$, longitude $144^{\circ} 17' E.$

For the entire North Pacific, taking into consideration the traveling cyclones and the more or less violent pulsations of the Aleutian low, the stormiest part of the ocean was that west of the 180th meridian.

From the 8th until the 12th a storm area lay between Honolulu and San Francisco. It remained nearly stationary midway between these two points until about the 12th, when it moved rapidly eastward, passing inland over central California. On the 11th, when the storm was apparently at its peak, the American S. S. *Manoa* was in a northwest gale, force 10, pressure 29.48 inches, near latitude $29^{\circ} N.$, longitude $145^{\circ} W.$

Other storms or depressions at various times entering our western coasts during the month were evidently extensions of or offshoots from the Aleutian low, and mostly occurred north of the United States. The dates of such entries were the 6th, 10th, 21st, 24th, 27th, and 31st.

The Aleutian low was generally in evidence. In the Gulf of Alaska and southward roughly to the 40th or 45th parallel, it was well developed from the 1st to the 10th, on the 17th and 18th, and from the 23d to the 31st. During the last period especially vessels traversing the area experienced rough weather, though reported gales did not exceed 10 in force until the 31st, when a 70-mile wind was reported off the coast below Seattle. During other portions of the month the low's center of activity was much to the westward, there occasionally spreading southward to and even beyond Midway Island.

The North Pacific high was fairly well developed until about the 8th, when it narrowed to a shallow band extending from Lower California westward to beyond Hawaii. It remained shallow and irregular in area until the 15th, when it assumed more control of the weather over the eastern part of the ocean south of the 40th parallel, but did not present its normal strength until the 28th to 31st, when it lay off the California coast with a crest of 30.20 to 30.30 inches.

Pressure over the eastern portion of the ocean, as determined from observations at the island stations, averaged below normal. At Dutch Harbor the mean for the month, based on p. m. observations, was 29.40 inches, or about 0.15 inch below normal. The change from the preceding month was approximately -0.20 inch. The highest pressure recorded was 30.10, on the 1st; the lowest, 28.64, on the 11th. At Midway Island the deficiency was relatively greater than at Dutch Harbor, being 0.14 inch. The normal for December is 30.02 inches. Readings above normal were recorded on only four days. The lowest pressure, 29.70, occurred on the 17th; the highest, 30.16, on the 31st. At Honolulu conditions were about the reverse of those at Midway, pressure being above normal almost continuously. The average for the month was 30.07 inches, an excess of some 0.05 inch. The highest reading, 30.16, was recorded on the 24th; the lowest, 29.92, on the 15th.

Fog was observed by steamers traveling the northern route during two periods, namely: From the 1st to the 4th, and from the 10th to the 20th. All occurrences were noted east of the 180th meridian. During the first period the phenomenon was mostly observed near the 50th parallel, except along the coast, where it was seen at least as far south as latitude $38^{\circ} N.$ During the second period fog was more widespread, and on the 11th and 12th had an observed southern limit near San Pedro.